A Histomorphological Study on Digestive System of Adult Hedgehog

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Abstract Four adult Hedgehogs(*Erinaceus euopaeus)*(two males and two females) captured from field were used in this test. The samples were quickly taken after killing, and fixed with 10% neutral HCHO. Paraffin sections were done along with HE dying. The results showed that their oesophagus were composed of stratified squamous epithelium, with light monkeiatinized shallow cell and well developed oesophageal glands. There are circular wrinkled wall and intestinal villus on the mucosa of the small intestine with developed small intestinal glands, long and thick intestinal villi in the duodenum, where exists Paneth cell on the basis of intestinal glands. It has isolated lymph nodule in the proper layer of the intestinum jejunum, as well as assemble lymph nodule in the proper layer of mucosa of the ileum. The number of lymph nodule in large intestine increases as compared with others, in which there is longitudinal wrinkled wall, but no intestinal villi. More developed large intestinal glands can be seen, where the cup cell rises gradually from forward to backward along intestinal system. In addition, there is no very clear boundary among liver lobule because the connective tissue among it is not developed well, and so does pancreas.

Key words: Hedgehog, *Erinaceus euopaeus* , Digestive system, Histomorphology

Introduction

Hedgehog(*Erinaceus euopaeus*) is a small beast of insectivora in the subclass of true beast. Since its skin can be used as medical materials and the fat is also valuable, this species is very useful for human being, and also has a great future to develop. At present, the studies on hedgehog is seldom reported, especially in its histomorphology. In this paper, a primary result and basis data feeding habits and digestive function of hedgehog are provided as reference for the future study.

Materials and Methods

Materials are from four Hedgehogs (two males and two females) captured from the field in spring of 1995. The tissues were taken immediately after killing, and fixed in 10% neutral HCHO. After that, it was covered in paraffin, and cut in a slice of 5-6 μm. The sample was observed by microscope and was measured after dying with HE. Photograph was taken by using OLYMPUS.

Results

Digestive system

Oesophagus Oesophagus consists of mucous layer, submucous layer, muscular layer and tunica externa.

Mucous layer is composed of epithelial mucous membrane, proper layer and mucous muscular layer. Epithelial mucosa is stratified squamous epithelium. Shallow cell is a little monkeiatinized, and turns into one-layer columnar epithelium in the boundary between cardia and stomach. The proper layer is a loose connective tissue which is full of elastic fibre, and forms high ripple sticking out to epithelium. Mucous muscle is composed of more developed non-striated muscle.

Submucous layer is composed of loose connective tissue, in which it is full of developed oesophageal glands. Oesophageal gland is a small spongy glandule with branch vessels, where most of the cells are mucous cells with round shape. Its nucleus is oblate, and kept in the base of the cell. Cytoplasm looks a little bit colorful and foamy. There are a number of mucus in alveoli of gland cavity. Submucous layer also contains bigger blood vessel, lymphatic vessel and nerve and so on.

Musclar layer: In the upper part of oesophagus, it has striated muscle with irregular musclar fibre in order. Striated muscle mixed with smooth muscle together in the middle of oesophagus. There only is smooth muscle in the lower part, with two layers and well developed.

Tunica externa is made up of a loose connective tissue, in which there are blood vessel, lymph vessel and nerve.

Ventriculus Gastric wall is composed of mucous layer, submucous layer, muscular layer and tunica externa. There are many longitudinal wrinkled walls on the mucous layer. It has much gastric pit on the surface of the mucosa, which is the exit of gastric glands. Mucous epithelium is one-layer columnar epithelium. The nucleus is ellipticum and located in the bottom of the cell. The proper layer, with much gastric gland, is well developed. The fundic glands which are distributed over the fundus of ventriculus is main gland in the gaster, that is branch or non-branch in shape. The cells, that consist of fundic glands, have main cell, wall cell, neck mucous cell and internal secretion cell. The main cell also names as gastric zymogenous cell, and is mainly distributed in gland body and gland_fundus in large numbers. The cell is short column in shape, with round nucleus, netted cytoplasm and basophilla. The wall cell is also called oxyntic acid cell. Its size is bigger than that of the main cell, round in shape. The nucleus is located in central part of the cell, small and round. Sometimes two nucleus can be seen. The cytoplasm is strong acid opilic and becomes red by coloring. The wall cell is mainly distributed among the main cell of neck and body of the glands, or out side of the cell. It is alone, with clear boundary. The neck mucous cells are in gland neck in groups, but a few in numbers. The nucleus is meniscoida in the bottom of the cell.

There exists gland layer between gland base and mucous muscle, which is composed of two layer. The inner layer contains many fibre cells, and extra layer is collagenous fibre.

Mucous muscle is more developed and consists of smooth muscle.

Submucous layer is also well developed, and composed of loose connective tissue, in which there are big blood vessels, lymph vessels and nerves.

Musclar layer is very developed, that mainly consists of three layers of smooth muscle.

Tunica externa is serosa, that is composed of a thin loose connective tissue covered by flat mesothelial cell.

Intestine Intestine can be divided into small and large intestine. The small intestine is divided into duodenum, jejunum and ileum. The large intestine is also divided into caecum, colon and rectum.

(1) Small intestine

Duodenum: intestinal wall is made up of mucous layer, submucous layer, muscular layer and tunica externa.

There are a lot of circular wrinkled walls on the surface of mucous layer, which is covered by finger-form villi. The villi, long and thick, is well developed. Epithelial mucosa is simple columnar epithelium that consists of much columnar and cup cell. The columnar cell, with elliptic nucleus in the bottom of the cell, acid opilic cytoplasm and becoming pink by HE dying, is superior in numbers. There are less cup cells which are distributed in columnar cell, with light cytoplasm and empty bubble on the upper part of the cytoplasm. The proper layer is composed of connective tissue which is full of netted fibre, and contains a number of intestinal glands in single tubular shape. Epithelium of the intestinal glands consists of much columnar cup and Paneth cell in the basis of intestinal glands. The size of Paneth cell in taper or column shape is bigger, with elliptic nucleus in the fundus of the cell. There are big acid opilic secretory granule within the cytoplasm. Muscular mucosa is made up of a large of thin smooth muscle. Submncous layer is composed of loose connective tissue, in which there are blood vessel, lymphatic vessel and nerve plexus.

Intestinum jejunum: intestinal villus is quite developed, and is column in shape. The number of cup cell in the jejumum is more than that in the duodenum. There are isolated lymph nodules in the proper layer. Intestinal villus in the parts with isolated lymph nodules is not well developed.

Intestinum ileum: There is not good circular wrinkled wall on the mucosa, on which intestinal villus is thin and short. The cup cell in the epithelium increases, in comparison with other parts. It has isolated lymph nodule and spreading lymph tissue in both of proper layer and submocous layer.

(2) Large intestine

Intestinum caecum: There is no circular wrinkled wall and intestinal villus on the mucosa, but some longitudinal wrinkled wall can be seen. The number of cup cell is more than that in small intestine. Epithelium mucosa is single columnar one, where exists a lot of cup cells. It has abundant lymph cells in the proper layer, with long and straight intestinal glands in good order, broad gland cavumity, but no Paneth cell. Muscular mocosa is not developed and submucous layer is composed of loose connective tissue, in which there are more fat cells. Two smooth muscles are in the muscular layer, and serosa as tunica externa.

Intestinum colon: There are more cup cells in epithelium than in intestinum caecum, with smooth mucosa on the surface. Wide and straight intestinal glands, well developed, exist in the proper layer. It has a large number of lymph nodule near the submucous layer, and full of spreading lymph tissue in it.

Intestinum rectum: The mucosa in the front part of rectum is similar to that in intestinum colon, which has longer intestinal glands. More cup cell is in the epithelium, and larger nerve plexus in the proper layer.

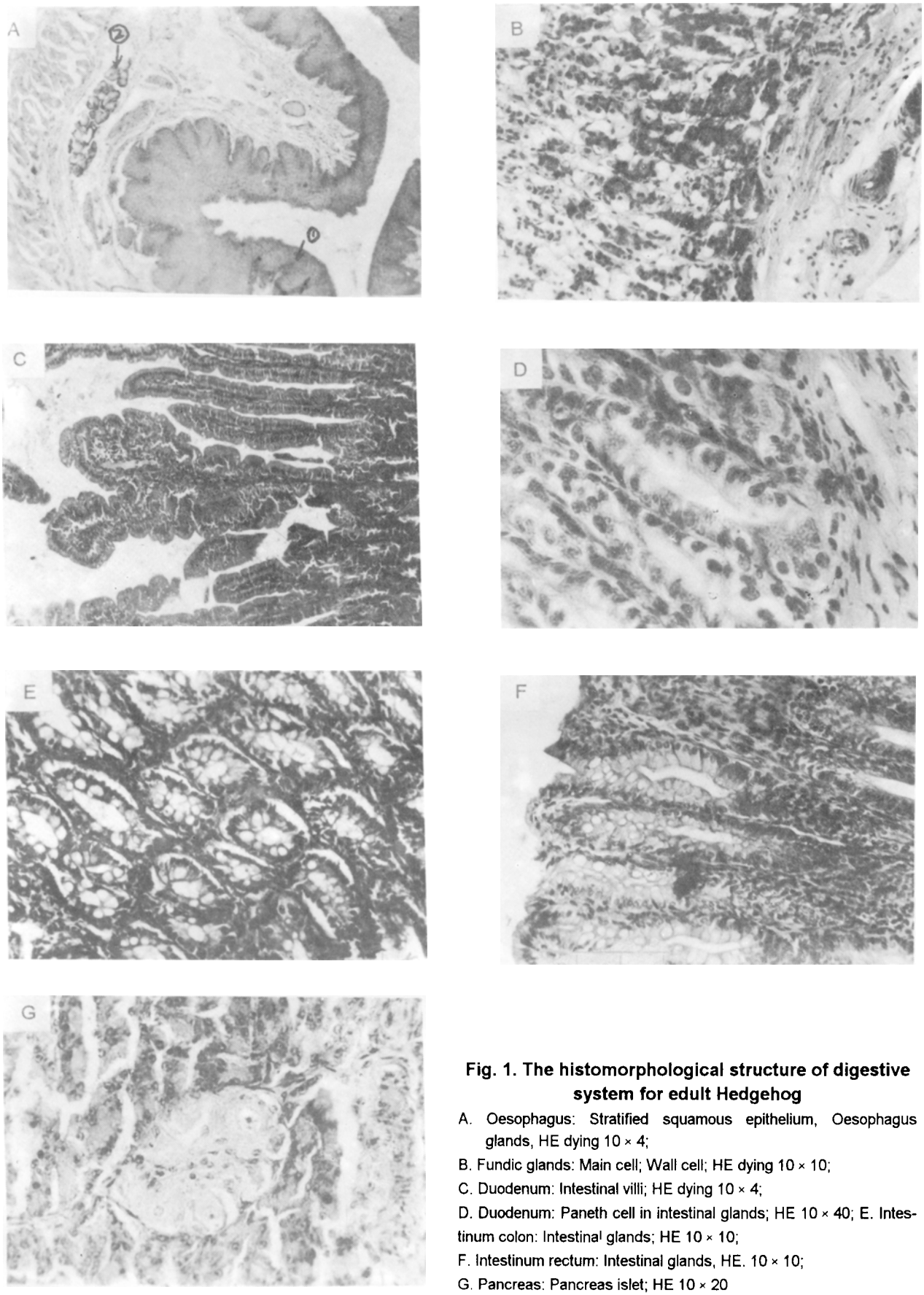

Fig. 1. The histomorphological structure of digestive system for edult Hedgehog

A. Oesophagus: Stratified squamous epithelium, Oesophagus glands, HE dying 10 × 4;

B. Fundic glands: Main cell; Wall cell; HE dying 10 × 10;

C. Duodenum: Intestinal villi; HE dying 10 × 4;

D. Duodenum: Paneth cell in intestinal glands; HE 10 × 40; E. Intestinum colon: Intestinal glands; HE 10 × 10;

F. Intestinum rectum: Intestinal glands, HE. 10 × 10;

G. Pancreas: Pancreas islet; HE 10 × 20

Digestive gland

Liver Hedgehog's liver is made up of multitubular gland, which consists of much liver lobule in turreted prism. It is covered by a fiber sac, in which the connective tissue goes to center part of liver along with blood vessel, nerve and liver tube, and divides the liver into much liver lobule. There is no clear limitation among liver lobule because its connective tissue is not well developed. Also, there is central vein in the middle of each liver lobule, where liver cell radiate around the central vein. The liver cell is in polyhedron, with bigger size, round nucleus in the conter of the cell. Liver plates coincide each other and become a net. There are irregular and branched liver sinusoids in the net mesh. Inner wall of the sinusoid consists of flat endothelium cell and Kupffer cell. Flat endothelium cell, with small size, a few cytoplasm, and falt round nucleus, goes to cavitus sinus. Kupffer cell, with big size and irregular shape, towers to connect with sinus wall together. Linning cell on the sinus wall is not continuous and has no base plate. The corner area of the connective tissue among adjacent liver lobules is named as joint area, in which there are artery, vein, bile duct and nerve among liver lobules.

Pancreas Pancreas is covered by a large of membrana tectoria, which grows some slim connective tissue to go into the central part of pancreas, and divides pancreas into many lobules. Pancreas is composed of external secretory and internal secretory part. External secretory part is separated to acinus and duct. Acinus is like solenocyte, with different size and small cavity gland. The opithelius gland cell is taper-like in shape, with spherical nucleus in the fundus of the cell. There are some acid opilic enzyme precursor pellets in cytoplasm, purplish red by HE dying. Duct comes from squamous light-colored centroacinar cell. The wider the diameter of the duct becomes, the taller the epithelius cell is gradually. Some cup cell can be seen in big epithelius duct. Internal secretory part is a group of cells among acinus of external secretory part, and covered by a thin membrana sac. It is pancreas islet cell that is in light colour by HE dying, with irregular order, smaller and fewer.

Conclusion

The histomorphological structure of digestive system for adult hedgehog is similar to other beasts. The basic feature of this animal is as follows:

Oesophagus mucous membrane is covered by stratified squamous epithelium, with light monkeiatinized shallow cells and well developed oesophageal glands.

There are much longitudinal wrinkled wall on gastric mucous membrane, where is full of gestric pits and high columnar epithelium cells. It has developed fundic glands in the proper layer. Subgland layer exists between fundic gland and mucous muscle layer.

There is circular wrinkled wall on the membrane of the small intestine, with long intestinal villus on the surface of mucosa. Also, there are much micro-villi on the intestinal villus to increase absorption surface. Subgland layer can not be found in the submucous duodenum.

Large intestinal membrane is smooth, but no intestinal villus. There are a large number of cupcells on the long and straight intestinal glands with rich lymph nodule, but no Paneth cell.

Sinuscoid Linning cell in liver is not continuous and no base plate, it seems that hedgehog's blood can get in touch with liver cell membrane directly.

There is no obvious difference in histomorphological stucture of digestive system between adult male and female hedgehog.

References

1. 芮菊生等. 1980. 组织切片技术. 北京: 人民教育出版社

2. H. D. 德尔曼, E. M. 布朗. 1989. 兽医组织学. 北京: 农业出版社,

3. 南京医学院组织胚胎学教研组编. 1979. 组织胚胎图谱. 北京: 人民卫生出版社,

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